Claims

[c1] 1. An analysis method, comprising:

detecting a chemiluminescent characteristic from each of a plurality of analytical samples, wherein at least one of the analytical samples comprises a composition comprising a non-biological organic polymer; and

determining a property of the composition based on the chemiluminescent characteristic.

[c2] 2. The method of claim 1, wherein the chemiluminescent characteristic is selected from the group consisting of time to detectable light output, time to peak light output, magnitude of peak light output, best-fit slope of light output versus time, and integrated area of light output versus time.

[c3] 3. The method of claim 1, wherein the chemiluminescence characteristics of at least about nine analytical samples are detected simultaneously.

[c4] 4. The method of claim 1, wherein the chemiluminescence characteristics of substantially all of the analytical samples are detected simultaneously.

[c5] 5. The method of claim 1, wherein the detecting a chemiluminescent characteristic utilizes a detector selected from the group consisting of charge-coupled devices, charge-injection devices, complementary metal oxide semiconductor devices, photodiode arrays, and photodetector arrays.

[c6] 6. The method of claim 1, wherein the detecting a chemiluminescent characteristic utilizes a detector comprising an avalanche photodiode.

[c7] 7. The method of claim 1, wherein the detecting a chemiluminescent characteristic utilizes a detector comprising a photomultiplier tube.

[c8] 8. The method of claim 1, wherein the detecting a chemiluminescent characteristic utilizes a detector comprising a silver halide photographic film.

[c9] 9. The method of claim 1, wherein the detecting a chemiluminescent characteristic utilizes a detector comprising an array detector.

[c10] 10. The method of claim 9, wherein the array detector comprises at least about 25 detection sites for each analytical sample.

[c11] 11. The method of claim 9, wherein the array detector comprises a cooled charge-coupled device.

[c12] 12. The method of claim 1, wherein the plurality of analytical samples is exposed to a temperature of at least about 120 ° C.

[c13] 13. The method of claim 1, wherein the plurality of analytical samples is maintained at a substantially constant temperature of at least about 120 ° C.

[c14] 14. The method of claim 1, wherein the plurality of analytical samples is maintained at a substantially constant temperature of at least about 120 ° C.

[c15] 15. The method of claim 1, wherein the plurality of analytical samples is exposed to at a first temperature of at least about 25 ° C during a first period of time, and exposed to a temperature increase of at least about 20 ° C during a second period of time, wherein detecting a chemiluminescent characteristic is performed during the second period of time.

[c16] 16. The method of claim 1, wherein the plurality of analytical samples is exposed to a temperature range spanning at least about 100 ° C during detection a chemiluminescent characteristic.

[c17] 17. The method of claim 1, wherein the plurality of analytical samples is exposed to a temperature range spanning at least about 100 ° C, the temperature range comprising a temperature of at least about 120 ° C.

[c18] 18. The method of claim 1, wherein the plurality of analytical samples is exposed to an oxidizing atmosphere.

[c19] 19. The method of claim 18, wherein the oxidizing atmosphere comprises molecular oxygen at a partial pressure greater than 25 kilopascals.

[c20] 20. The method of claim 1, further comprising replacing an inert atmosphere with an oxidizing atmosphere during the detecting a chemiluminescent

characteristic.

[c21] 21. The method of claim 1, wherein the plurality of analytical samples is maintained at a pressure of at least about 150 kilopascals.

[c22] 22. The method of claim 1, further comprising exposing the plurality of analytical samples with light exposure of at least about 10 mJ/m^2, the light comprising a wavelength of about 295 nanometers to about 400 nanometers.

[c23] 23. The method of claim 1, further comprising irradiating the plurality of analytical samples with light having an illuminance of at least about 10 W/m^2, the light comprising a wavelength of about 295 nanometers to about 400 nanometers.

[c24] 24. The method of claim 1, wherein the non-biological organic polymer comprises at least one polymer selected from the group consisting of thermoplastic resins and thermosetting resins.

[c25] 25. The method of claim 1, wherein the non-biological organic polymer comprises a polymer selected from the group consisting of polyethylene, polypropylene, polyisoprene, polysiloxanes, polyolefins, linear low density polyolefins, acrylate polymers, methacrylate polymers, poly(alkylene oxides) polymers, poly(vinyl chloride), poly(vinylidene chloride), poly (tetrafluoroethylene), polycarbonate resins, polyphenylene ether resins, polyphenylene sulfide resins, poly(alkylene aromatic) resins, vinyl aromatic graft copolymers resins, polyester resins, polyamide resins, polyesteramide resins, polysulfone resins, polyimide resins, polyetherimide resins, styrene copolymers, acrylonitrile butadiene styrene copolymers, poly(ethylene-vinylacetate), epoxy resins, phenolic resins, alkyds, allylic resins, polyester thermosetting resins, polyimide thermosetting resins, polyurethane resins, bis-maleimide resins, cyanate ester resins, vinyl resins, benzoxazine resins, benzocyclobutene resins, and mixtures comprising at least one of the foregoing polymers.

[c26] 26. The method of claim 1, wherein the non-biological organic polymer comprises a polymer selected from the group consisting of polypropylene, polyethylene, ethylene-propylene copolymers, poly(ethylene-vinylacetate), polycarbonates, polyesters, polyamides, polyetherimides, polyphenylene ethers, polyphenylene sulfides, poly(alkylene aromatic) polymers, acrylonitrile butadiene styrene copolymers, acrylic styrene acrylonitrile copolymers, and mixtures comprising at least one of the foregoing polymers.

[c27] 27. The method of claim 1, wherein the composition additionally comprises an additive selected from the group consisting of antioxidants, stabilizers, ultraviolet light absorbers, fillers, reinforcing agents, flame retardants, mold release agents, and mixtures comprising at least one of the foregoing additives.

[c28] 28. The method of claim 1, wherein determining a property of the composition based on the chemiluminescent characteristic comprises determining a thermal stability, an oxidative stability, or a light stability.

[c29] 29. The method of claim 1, further comprising preparing a plurality of analytical samples, wherein at least about 50 percent of the analytical samples comprise a composition comprising a non-biological organic polymer.

[c30] 30. The method of claim 29, wherein preparing a plurality of analytical samples comprises preparing a solution comprising a non-biological organic polymer.

[c31] 31. The method of claim 29, wherein preparing a plurality of analytical samples comprises delivering a non-biological organic polymer as a solid to a sample array.

[c32] 32. The method of claim 31, further comprising delivering at least one additive to the sample array as a solution in a suitable solvent, evaporating the solvent, and heating the sample array to promote diffusion of the at least

one additive into the non-biological organic polymer.

[c33] 33. The method of claim 31, further comprising delivering at least one additive to the sample array as a solution in a suitable solvent, heating the sample array to promote dissolution of the at least one additive and the non-biological organic polymer, and evaporating the solvent.

[c34] 34. The method of claim 29, wherein the plurality of analytical samples are prepared from a continuous sheet comprising a non-biological organic polymer.

[c35] 35. The method of claim 1, wherein a sample array comprises the plurality of analytical samples.

[c36] 36. The method of claim 35, wherein the sample array comprises a plurality of wells comprising opaque walls.

[c37] 37. The method of claim 35, wherein the sample array comprises a plurality of wells comprising a reflective coating.

[c38] 38. The method of claim 35, wherein the sample array comprises a plurality of wells comprising a metal coating.

[c39] 39. The method of claim 35, wherein the sample array comprises a lens array.

[c40] 40.The method of claim 39, wherein the lens array comprises at least one ball lens.

[c41] 41. The method of claim 39, wherein at least one optical fiber operably couples the lens array to a chemiluminescence detector.

[c42] 42. The method of claim 41, wherein the at least one optical fiber comprises a tapered fiber.

[c43]

43. A method for accelerated stability testing of polymer compositions, comprising:

exposing a plurality of polymeric compositions to at least one environmentally stressful condition; wherein the environmentally stressful condition comprises at least one condition selected from the group consisting of a temperature greater than about 120 ° C, a light exposure greater than about 10 mJ/m^2, and an oxygen pressure greater than about 25 kilopascals; and wherein the polymeric composition comprises a non-biological organic polymer;

detecting a chemiluminescent characteristic from each of the plurality of polymeric compositions; and predicting a stability property of each of the plurality of polymeric compositions based on the chemiluminescent characteristic.

[c44] 44. An analytical system comprising:

a temperature controller for maintaining a plurality of analytical samples at a temperature of at least about 120 ° C;

a detector for detecting a chemiluminescent characteristic from each of the plurality of analytical samples; and

a computer for determining a property of the composition based on the chemiluminescent characteristic.

[c45] 45. An analytical system comprising:

a temperature controller for maintaining a plurality of analytical samples at a temperature of at least about 120 ° C;

a cooled CCD detector for detecting a chemiluminescent characteristic from each of the plurality of analytical samples;

a fiber-coupling lens array comprising at least one lens for collecting and focusing light from each analytical sample;

a plurality of optical fibers operably coupled to the fiber-coupling lens array;

a fiber array-detector interface operably coupling each optical fiber to a unique region of the cooled CCD detector; and

a computer for determining a property of the composition based on the detected chemiluminescence and, optionally, for responsively

controlling the detector.